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(71) Applicant: 000183233
SUMITOMO RUBBER IND. K.K.,

6-9, 3-Chome, Katsuhama-cho,
Chuo-ku, Kobe-shi, Hyogo-ken

(72) Inventor:
T. NISHIKAWA
8-10-302, 3-Chome, Karibadai,
Nishi-ku, Kobe-shi, Hyogo-ken

(72) Inventor:
K. IWASAKI
337, 2-Chome, Nishi-Jiyugaoka,
Ezome-cho, Miki-shi, Hyogo-ken

(72) Inventor:
H. HASEGAWA
Tsubo 76-1-405,
Himeji-shi, Hyogo-ken

(74) Agent:
S. EHARA, Patent Agent (and 3 others)

(54) Title: ARTIFICIAL TURF

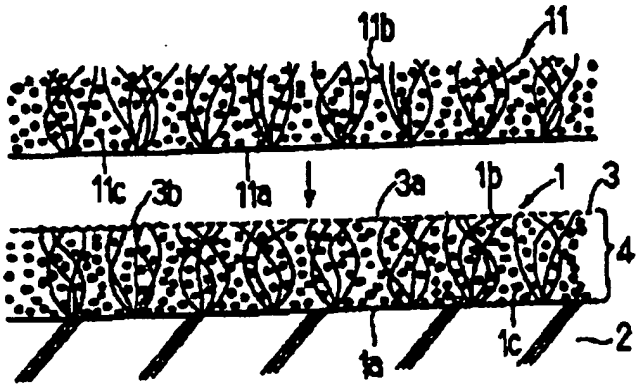
(57) Abstract:

Issue:

To enable the repair of existing turf without harming its water discharge function and to maintain low repair costs.

Solution means:

Artificial turf 11 is repaired by placing new artificial turf 11 on existing artificial turf 1. A coating agent 3, such as urethane, acrylic emulsion or asphalt emulsion, etc., is coated on the surface of existing turf 1 to prevent movement of granular substance 1c. The coating agent 3 is applied in a quantity equivalent to 90 g/m^2 ~ 1050 g/m^2 (expressed as solid) and it provides water permeability to existing turf 1.



PATENT CLAIMS

Claim 1

For existing artificial turf, in which multiple synthetic resin yarns are planted on a base cloth, a granular substance is filled in between the yarns, a coating agent, to prevent movement of the granular substance, is applied to form a foundation material composed of the existing artificial turf and the coating agent, and for such foundation material onto which new artificial turf is placed, an artificial turf that ensures water permeability of the coating layer by applying a coating agent with 90 g/m^2 ~ 1050 g/m^2 solid substance.

Claim 2

Artificial turf of Claim 1, coated with a coating agent with 90 g/m^2 ~ 1050 g/m^2 solid substance for a water permeation treatment.

Claim 3

Artificial turf of Claim 1, having a part in which the gap between the granular substance is filled by the coating agent that is applied in the form of stripes or scattered points, and a part in which the said gap still remains.

Claim 4

Artificial turf of Claim 1, in which a through-hole is provided in the foundation material as the water-permeability treatment.

DETAILED EXPLANATION OF THE INVENTION

[0001]

Area of technology of the invention

This invention relates to artificial turf used on tennis courts, baseball grounds, open squares, park paths, etc.

[0002]

Conventional technology

Artificial turf with sand is widely used as a pavement material for sports facilities such as tennis courts, etc., and is classified into non-water-permeable type and water-permeable type. In

the former, water flows through the gap among the filled-in sand or its surface and the water is discharged from the end of the artificial turf. In the latter, a water-permeation hole is made in the base cloth and the water passing through the gap in the sand is discharged through the water-permeation hole and the water-permeable base material.

[0003]

For such artificial turf with sand, the old artificial turf needs to be discarded and new artificial turf is installed when the artificial turf reaches its usage limit due to wear, etc., regardless of whether it is non-water-permeable type or water-permeable type. In this case, the discarded artificial turf needs to be processed as an industrial waste and the process takes time, labor, and costs money. This process could cause a pollution problem.

[0004]

Patent 2053028 discloses a technology as a solution for this problem. In it, a coating material is applied onto the entire surface of the artificial turf to prevent movement of the granular substance, such as sand, etc., and new artificial turf with sand is placed on top of it. Thus, removal of the existing artificial turf is unnecessary and slipping (shifting) of the new artificial turf is prevented assuredly because the granular substance of the new artificial turf is fixed by the coating agent.

[0005]

Problem this invention intends to solve

However, in actuality, the coating agent enters into the gap of the sand and the existing turf is made non-water-permeable, so that a non-water-permeable type that discharges water along its gradient must be selected as the new artificial turf with sand. When the existing turf has a concave part, the new artificial turf placed on it forms a concave part, too, which interferes with quick water discharge. Therefore, the concave part of the existing turf needs to be filled with a repair material such as gypsum, cement or asphalt, etc., which is labor-intensive, time-consuming and costly. The repaired part is non-water-permeable for sure, so that the water-discharging function of the existing turf, that utilizes the gaps in the sand, suffers.

[0006]

The objective of this invention is to offer an artificial turf that can be repaired inexpensively without deterioration of the water-discharging function of the existing turf.

[0007]

Means to solve the problem

To achieve the above objective, this invention is for existing artificial turf in which multiple synthetic resin yarns are planted on a base cloth, a granular substance is filled in-between the yarns, a coating agent, to prevent movement of the granular substance, is applied to form a foundation material composed of the existing artificial turf and the coating agent, and for such foundation material onto which new artificial turf is placed, an artificial turf that ensures water permeability of the coating layer by applying a coating agent with 90 g/m^2 ~ 1050 g/m^2 solid substance.

[0008]

[Deleted according to the Correction on Japanese page (6) - Translator].

[0009]

The water permeation process can be the mixed provision of a part in which the gap between the granular substance of the existing artificial turf is filled and a part on which the said gap remains, which can be realized by applying the coating agent in the form of stripes or in the form of scattered points.

[0010]

Another water permeation process can be the provision of through-holes in the foundation material.

[0011]

Practical Example

A practical example of this invention is explained below with the aid of Figures 1-5.

[0012]

In Figures 1-3, existing artificial turf 1 is placed on base 2 of flat asphalt, concrete, etc. Artificial turf 1 is composed of multiple flat and straight split [sic] yarns or monofilament yarns 1b made of synthetic resin, such as nylon, polypropylene, etc., which are planted on base cloth 1a of flat woven polypropylene, etc., by tufting, etc., at set intervals. Fine granular substance 1c, such as

fine sand, quartz sand or a high-molecular material or their mixture (sand) is filled in the gaps in the artificial turf 1.

[0013]

For placement of new artificial turf 11 on existing artificial turf 1, coating agent 3, such as of urethane, acrylic emulsion or asphalt emulsion, etc., is applied on the top surface of existing artificial turf 1 to prevent movement of granular substance 1c. The reason for applying the coating agent 3 is that, if granular substance 1c is exposed on existing turf 1, the newly placed artificial turf 11 tends to slip and become unstable because of the rolling action of the granular substance 1c.

[0014]

In the artificial turf of this invention, foundation material 4, composed of existing turf 1 and coating agent 3 is processed (water-permeation process) to ensure the water-permeability of said foundation material 4. An example of the water-permeation process is explained below.

[0015]

Figure 1 shows the 1st example of the water-permeation process. Coating agent 3 is used in the process at a rate of 90 g/m^2 ~ 1050 g/m^2 (solid conversion), preferably 150 g/m^2 ~ 520 g/m^2). If the rate is lower than 90 g/m^2, unfixed granular substance 1c remains on the surface of existing turf 1 and new turf 11 tends to slip on it. On the other hand, if the rate is higher than 1050 g/m^2, the gap between granular substance 1c, inside existing turf 1, is filled with coating agent 3 and the water-permeability suffers greatly.

[0016]

The application of coating agent 3 can be as follows. One method is the spraying of coating agent 3 and this method is suitable for coating agents 3 of relatively low viscosity. For coating agents 3 of high viscosity, such as an asphalt emulsion, coating agent 3 is spread with a ladle, etc., and spread thinly and widely with a rake, etc. A solid consisting of granular substance 1c and coating agent 3 tends to form before coating agent 3 settles on the surface of existing turf 1 and, in this case, coating agent 3 is difficult to spread and a thin uniform coating is hard to realize. Spraying water on existing turf 1, in advance, is recommended to solve such a problem. If unfixed granular substance 1c is in excess on the surface of existing turf 1, unfixed granular substance 1c can remain on the surface even after spreading of coating agent 3 so that removal of the granular

substance to a degree that exposes approximately 1 mm of the yarn stem of existing turf 1 is preferable. Also, brushing, etc., can produce a uniform work condition.

[0017]

When coating agent 3 is uniformly coated at the said rate and dried, multiple holes 3a are formed on the coating surface and such holes 3a assure the water-permeability of the coating layer. Since coating agent 3 is spread only on the surface of existing turf 1 and does not penetrate into existing turf 1, a gap can be left between granular substance 1c inside of existing turf 1. Meanwhile, the granular substance on the surface of existing turf 1 is fixed and held by coating agent 3. Therefore, the water-discharging function of existing turf 1 is not harmed and slipping of new turf 11 can be prevented, even when new turf 11 is applied. In such a case, the non-water-permeable type can be selected for new turf 11 and thereby filling of a repair agent in the concave part, in advance of the work, etc., can be omitted. The surface of coating agent 3 is uneven after its coating because of granular substance 1c. Therefore, base cloth 11a of new turf 11 is gripped by such unevenness to prevent movement.

[0018]

If the application of coating agent 3 is uneven, film 3b (shown by the wavy line) may form and the water-discharge function can suffer. However, even in such a case, light drilling of film 3b (using a screw driver, etc.) can maintain the water-discharge function of existing turf 1 because the gap in-between granular substance 1c is left inside existing turf 1.

[0019]

After granular substance 1c of existing turf 1 is stabilized as above, new artificial turf 11 is placed on the entire surface and granular substance 1c is filled in the said turf to a set thickness. This new turf 11 also has multiple synthetic resin yarns 11b placed in base cloth 11a, similarly to existing artificial turf 1. Yarn 1b, which protrudes from granular substance 1c of existing turf 1, is pressed onto granular substance 1c by the weight of new turf 11, so that new turf 11 is emplaced in a stable manner.

[0020]

Incidentally, construction of Figure 1 can be applied to both water-permeable type and non-water-permeable type existing turf 1. If base material 2 is water permeable, drilling of through-holes in base material 2 improves water discharge function.

[0021]

Figure 2 shows a 2nd example of the water-permeation process applied to foundation material 4. Here, coating agent 3 is applied in a stripe pattern or scattered pattern form. Coating agent 3 impregnates the interior of existing turf 1 and the mixture, of the part in which the gap between the granular substance is filled, 1b, (hatched area) and a part in which the said gap remains, 1d, (nonhatched area) is formed. In such case, water-permeability is ensured by part 1c with the remaining gap between granular substance 1c, so that the water-discharge function of foundation material 4 is maintained. Too wide an area of coating agent 3 decreases water permeability and, on the other hand, too small an area of coating agent causes new turf 11 to slip. Therefore, the area ratio between area 1d of coating agent 3 and area 1e without coating agent is determined to satisfy both of the above cases.

[0022]

Application of coating agent 3 is at a rate of 90 g/m^2 or higher (solid conversion) of the solid in coating agent 3, in average across the entire area of coating, for sufficient fixing of the granular substance. Here, the preferred rate of application is for thorough penetration of coating agent 3 into existing turf 1. The type of coating agent 3 is similar to the case in Figure 1 and the coating method, too, is similar to Figure 1, where a spray or rake, etc., are used depending on the viscosity of coating agent 3. Removal of excess granular substance, adjustment of the level of the turf and spraying water, etc., on existing turf 1, in advance of coating, is preferably similar to Figure 1.

[0023]

Incidentally, this water-permeation process, too, can be applied to both the water-permeable type and non-water-permeable type existing turf 1, similarly to the case in Figure 1.

[0024]

Figure 3 shows a 3rd example of the water-permeation process that is applied to foundation material 4, and, here, multiple through-holes 5, that open at the bottom of existing turf 1, are formed in foundation material 4 by drilling, etc., after coating agent 3 was applied. The water in foundation material 4 is discharged via through-holes 5 so that the water-discharge function of the foundation material 4 is maintained. Since through-holes 5 discharge water, the presence or absence of a gap in granular substance 1c is not a problem. Therefore, all gaps can be filled by

coating agent 3 applied at a rate of 1050 g/m^2 or higher. The type of coating agent 3 is similar to Figure 1 and the coating method is similar to Figure 1 too, where a spray or rake, etc., is used depending on the viscosity of coating agent 3. Removal of excess granular substance on the surface of existing turf 1, adjustment of its level, and water spraying, etc., in advance of coating, is preferable, similarly to the case in Figure 1.

[0025]

Incidentally, the said method is only applicable in the case of presence of water permeability in foundation base 2.

[0026]

The above 3 method types can be used individually or in combination.

[0027]

Practical Example

The level of sand 1c of 3 adjacent artificial turfs (water-permeable type) was made uniform and then 3 processes of the following Practical Example and Comparative Examples 1 and 2 were carried out and the finishes were compared.

[0028]

Practical Example (pavement area 650 m^2)

A cationic asphalt emulsion (meets JIS K-2208 specification = evaporation residue: 51%, specific gravity: 1.03, equivalent to Aszol PM [sic] of Nichireki K.K.) was applied onto the top surface of the existing turf. Then the existing turf was sprayed with water to provide for good spreading of the emulsion. The emulsion, which was spread with a ladle, was raked to a wide area. The rate of coating was 0.7 L/m^2 (residual solid conversion: 370 g/m^2 and a 5 mm hole was drilled in the emulsion-coated area where the water remained as a result of water-spraying. Thereafter, the water-permeable artificial turf with sand was laminated on top of the above.

[0029]

Comparison Example 1 (pavement area 650 m^2)

The asphalt emulsion mentioned above was spread by using a watering can. The rate of spreading was 2.3 L/m^2 (residual solid conversion: 1210 g/m^2) for spreading the emulsion on the entire pavement area. A 5 mm hole was formed by drilling in the area where water remained as the

result of spraying of water. The area where water remained even after drilling the hole was judged to be the non-water-permeable part and the concave part was filled with an asphalt-mortar mixture of 10 kg quartz sand and 3 kg asphalt emulsion. Artificial turf with sand was placed on top of the above under these conditions.

[0030]

Comparison Example 2 (pavement area 650 m^2)

The abovementioned asphalt emulsion was spread with a watering can onto the entire pavement area. The rate of spreading was 2.3 L/m^2 (residual solid conversion: 1210 g/m^2). A 5 mm hole was drilled in the area with water remaining, and the area with residual water, even after drilling the holes, was judged to be the non-water-permeable part and the holes were drilled to reach the base material. Artificial turf with sand was laminated on top of the above under the above conditions.

[0031]

Figures 4 and 5 show the test result on the finishes of the above Practical Example and Comparison Examples 1 and 2. The figures show the superiority of this invention (Practical Example) to the Comparison Examples, both in finish and workability.

[0032]

Effect of the invention

As explained above, this invention enables the lamination of new artificial turf, in a stable manner and at a low repair cost, without harming the water-discharge function of the existing artificial turf.

[0033]

Furthermore, water-permeable type or non-water-permeable type can be selected as the new turf, so that the complex advance work necessary to use of the non-water-permeable type, for example, filling of repair agent, etc., can be omitted.

Brief explanation of the Figures

Figure 1 is a cross-section of the pavement process for the artificial turf of this invention.
Figure 2 is a cross-section of the pavement process for the artificial turf of this invention.
Figure 3 is a cross-section of the pavement process of the artificial turf of this invention.

Figure 4 is a test result on the workability of the Practical and Comparative Examples.
Figure 5 is a test result on the finish of the Practical and Comparative Examples.

Explanation of the codes

1 - existing artificial turf
1a - base cloth
1b - yarn
1c - granular substance
2 - base material
3 - coating agent
4 - foundation material
5 – through-hole

Figure 1

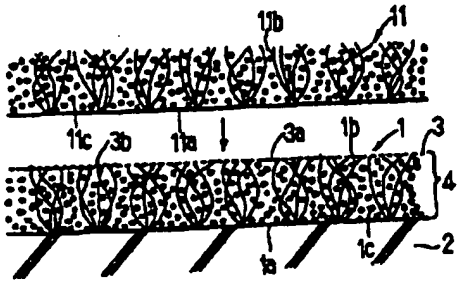


Figure 2

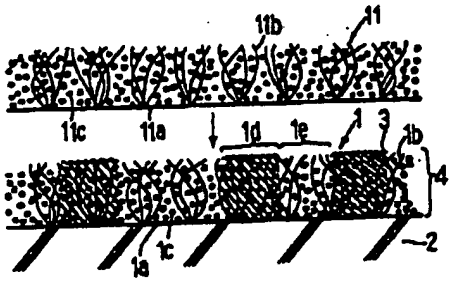


Figure 3

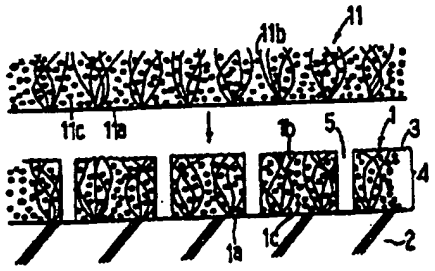


Figure 4

Workability (No. of days of work)

	emulsion coating	water-spray hole drilling	Asmol [sic] repair	inspection of artificial turf with sand	total No. of days
Practical Example	3 men, 1 day	3 men, 3 h	unnecessary	2½ days	approx. 4 days
Comparative Example 1	3 men, 1 day	3 men, 6 h	3 men, 3 h; 1 day waiting for drying		approx. 5 days
Comparative Example 2	3 men, 1 day	3 men, 6 h	unnecessary		approx. 4 days

Figure 5

Finishing

	water accumulation during the work			water accumulation after lamination of the new artificial turf with sand
	after emulsion coating	after hole drilling	after hole drilling	
Practical Example	approx. 100 m^2	approx. 0 m^2	-	standing water disappears in approx. 1.5 h after rain stops
Comparative Example 1	approx. 280 m^2	approx. 70 m^2	-	standing water area of approx. 10 m^2 for 2 h after rain stops
Comparative Example 2	approx. 250 m^2	approx. 60 m^2	approx. 0 m^2	standing water disappears in approx. 1.5 h after rain stops